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TOO MUCH REINFORCEMENT, TOO LITTLE BEHAVIOR: ASSESSING TASK INTERSPERSAL PROCEDURES IN CONJUNCTION WITH DIFFERENT REINFORCEMENT SCHEDULES WITH AUTISTIC CHILDREN

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Task interspersal procedures have been quite effective in increasing autistic children's motivation to learn. These procedures have typically demonstrated that the inclusion of reinforced maintenance tasks (previously learned tasks) increases responding to new acquisition tasks because more reinforcers, in general, are available. However, studies have not specifically addressed the effects of various schedules of reinforcement, used in conjunction with task interspersal procedures, upon response acquisition. In the present study, a multiple baseline design across subjects was used to assess different reinforcement schedules. Five autistic children participated in learning sessions, during which trials of an acquisition task were interspersed with trials of three maintenance tasks. Correct responses to acquisition tasks were continuously reinforced throughout all conditions, while the reinforcement schedule for competent performance of maintenance tasks differed systematically. Results indicated that all children learned the new tasks when food reinforcers were presented only for acquisition tasks. Results are discussed in terms of behavioral contrast and improving the effectiveness of motivation-enhancing procedures for autistic children.

DESCRIPTORS: autism, task interspersal, reinforcement

Autistic children's pervasive lack of responsiveness to task instruction and subsequent failure to acquire many appropriate behaviors have often been attributed to their general lack of motivation to learn (e.g., Dunlap, 1984; R. Koegel & Egel, 1979). In the late 1970s and early 1980s, researchers began to investigate the efficacy of task interspersal procedures as a means of increasing motivation (e.g., Dunlap, 1984; Dunlap & Koegel, 1980). Task interspersal procedures generally entail designing instructional paradigms to provide for the presentation of previously learned maintenance tasks commingled with the presentation of acquisition tasks. Interspersal typically results in an increase in the overall amount of reinforcement presented in the learning session, in that reinforcers are obtained relatively frequently for competence on maintenance tasks.

The literature regarding the educational impact of task interspersal procedures has been quite promising. Dunlap and Koegel (1980) demonstrated with autistic children that higher percentages of correct responding on acquisition tasks occurred

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when maintenance tasks were interspersed than when only a single acquisition task was presented. Importantly, Dunlap (1984) demonstrated that the interspersal must include maintenance tasks, and that merely interspersing several acquisition tasks did not facilitate learning. The benefits of task interspersal procedures have been replicated across populations (e.g., L. Koegel & Koegel, 1986).

In order to advance previous research on task interspersal procedures, additional parameters of their use warrant assessment. One area of study is that in which task interspersal procedures have been less successful: when they are used during baselines to maintain the child's general responsiveness in the learning setting. Baselines often have the undesirable side effect of providing many trials of new tasks, with an associated high response–reinforcer ratio. To lower this ratio so that responding does not cease or deteriorate, task interspersal methods have been integrated into baselines to increase the overall rate of available reinforcement (R. Koegel & Egel, 1979). For example, during pretests, Schreibman and Carr (1978) provided food reinforcers and praise on a variable-ratio (VR) 2 schedule for responses to maintenance tasks such as eye contact and good sitting. McGee, Krantz, and McClannahan (1986) provided food reinforcers or access to toys on a VR 3 schedule contingent upon instruction following and eye contact, in addition to the occurrence of target responses. In another study, Charlop, Schreibman, and Tryon (1983) interspersed maintenance tasks (e.g., eye contact and "touch your nose") after approximately five trials of the target behavior. Satisfactory performance on these maintenance tasks was followed by food reinforcers on a VR 2 schedule and praise on a continuous reinforcement (CRF) schedule.

In the above studies, the target behaviors were not acquired during baseline, although task interspersal procedures were in effect. It is possible that the interspersal procedures provided schedules of reinforcement that actually favored response to the maintenance task and perhaps encouraged responsiveness in general, but they may have inadvertently decreased responding to new target tasks. That is, in some instances, task interspersal procedures may result in the child discriminating that reinforcers are readily available for correct responding on previously learned tasks and that correct responding to new tasks is not necessary in order to obtain reinforcement. Indeed, previous research on task interspersal suggests that merely increasing the amount or density of reinforcement alone is not very effective (Dunlap, 1984; Neef, Iwata, & Page, 1980). It thus seems relevant to explore the efficacy of task interspersal procedures in conjunction with different reinforcement contingencies. The present study was designed to compare three reinforcement contingencies used with task interspersal. Both schedule and type of reinforcer (primary vs. secondary) were varied. Additionally, ancillary self-stimulation and off-task behaviors were observed to assess any concomitant side effects.

METHOD

Subjects

Five children who had been diagnosed as autistic according to the criteria of the National Society of Autistic Children (Ritvo & Freeman, 1978) and the DSM III (American Psychiatric Association, 1980) participated in this study. Each child had a history of difficulty with learning new tasks and was described by parents and teachers as being difficult to motivate and generally unresponsive during learning trials. The children preferred to be left alone and resisted attempts at interaction. Each child participated in an after-school behavioral treatment program where the present experiment was conducted. The children had been attending this program for at least 6 months prior to the start of this study. Thus, each child had a fairly long history of exposure to task interspersal procedures. During the study, each child participated in twice-a-week tutorial sessions during which his or her behavior problems, as well as the academic curriculum, were addressed. All children demonstrated a preference (through observation and parent report) for certain food reinforcers, which were used during the study. In addition, the participants were familiar with praise as reinforcers (e.g., "good job," "that's right," "good boy/girl").

Gloria was a 4-year 4-month-old girl who was

Table 1
Acquisition Tasks and Order of Presentation of Experimental Conditions

	Acquisition task	Experimental conditions
Gloria	Task 1: Put next to	BL,* no reinforcers, BL, praise only
	Task 2: Raise arms	BL, praise only, no reinforcers, BL
Marina	Task 1: Give me big	BL, praise only, BL, no reinforcers
	Task 2: Touch arm	BL, no reinforcers, praise only, BL
Paul	Task 1: Left/right	BL, praise only, BL, no reinforcers
	Task 2: First/last	BL, no reinforcers, praise only, BL
Joshua	Task 1: Left/right	BL, no reinforcers, BL, praise only
Jim	Task 1: Left/right	BL, no reinforcers, praise only, BL

* BL = baseline.

considered untestable; therefore, her mental age was not obtained. She was nonverbal and emitted only a few sounds. She had a very limited receptive vocabulary and few imitative skills. She frequently engaged in self-stimulatory behaviors such as grimacing, hand regarding, and body rocking. She often engaged in tantrums and self-injurious behavior (hand biting, face hitting).

Marina was a 5-year-old girl with a mental age of 1 year 7 months, as determined by her performance on the Slosson Intelligence Test. She was nonverbal, demonstrated a few imitation skills, and followed requests such as "stand up" and "get the ball." Marina frequently engaged in self-stimulatory behaviors, which included hand flapping, eye gazing, tapping, and body arching. Her off-task behaviors included inappropriate giggling and noncompliance, and she rarely engaged in spontaneous eye contact.

Paul was a 5-year 3-month-old boy whose mental age was deemed untestable. His speech consisted mostly of immediate and delayed echolalia, with some appropriate phrases and short sentences. Paul was noncompliant and aggressive. His self-stimulation included body arching, hand regarding, and head rolling.

Joshua was a 6-year 2-month-old boy with a mental age of 3 years 1 month (Slosson Intelligence Test). He exhibited both immediate and delayed echolalia and displayed some appropriate speech. He used few full sentences and rarely initiated verbal interactions. His eye contact was poor, and he occasionally engaged in tantrums and aggression. Although Joshua displayed these off-task behaviors, his self-stimulation was minimal.

Jim was a 6-year 4-month-old boy whose mental age was not available. Jim frequently displayed both immediate and delayed echolalia, with some appropriate speech. He rarely spoke spontaneously. He engaged in a variety of self-stimulatory behaviors, such as hand waving, eye gazing, tapping, and pacing. He was also frequently noncompliant and aggressive.

Setting

Sessions were held in a tutorial work room (2.9 m by 2.9 m) where the children attended an afterschool behavioral treatment program twice a week for 90-min sessions. A one-way mirror connected the work room to an observation room. In the work room were two child-sized chairs, a table, a tray of a variety of the child's favorite food reinforcers, and a variety of toys. Two 15-min experimental sessions were held weekly as part of the tutoring session.

Dependent Variables

This study assessed the effect of different schedules of reinforcement upon acquisition task performance. Two acquisition tasks were presented to each child (except Joshua, who ceased participation in the program, and Jim, whose family moved away before completion of the study). Acquisition tasks were chosen from each child's school curriculum. Acquisition tasks and the order of presentation of experimental conditions for each child are shown in Table 1.

Maintenance tasks were those tasks that the child had performed at an average of 80% accuracy during at least 3 months before the onset of the present study. The maintenance tasks included (a) placing

Table 2
Operational Definitions of Stereotypy and Off-Task Behaviors for Each Child

	Stereotypy	Off-task behavior
Gloria	Repetitive hand movements; hand clenching; shoulder raising; repetitive verbal sounds; repetitive head movement; swaying upper body; swinging feet; facial grimacing.	Crying; looking away; SIB (hitting face, head, legs); slouching in chair; leaning on table or lap board; grabbing food.
Marina	Repetitive finger movements; cocking head to one side; hand flapping or hands up; hand rubbing; slapping hands on lap; tapping; putting object in or near mouth; facial grimacing; swinging feet; body arching or tensing.	Standing up or getting out of chair; pushing chair back; repetitive laughing.
Paul	Repetitive finger movements; rubbing hands on legs or head; tensing neck and shoulders; arching back or body; jerking head; facial grimacing; tongue thrusting; sucking/biting hand or fist; hair twirling.	Pushing or leaning chair back; getting out of seat; not letting go of object.
Joshua	Rubbing hands on legs; repetitive finger movements; tongue thrusting; rubbing zipper; arching hands; swinging feet; staring at hand or fist; hair twirling.	Aggression; getting out of seat; leaning chair back; repetitive laughing.
Jim	Repetitive finger or hand movements; head shaking; swinging feet; stamping feet on floor; touching therapist or lap board; staring at raised hands.	Getting out of seat; turning around in seat; pushing chair back; leaning on table or lap board; turning head away; putting legs/feet straight out or on chair; aggression.

hands flat on one's lap after the experimenter's request of "hands down," (b) providing immediate eye contact lasting for approximately 2 s contingent upon the experimenter's request of "look at me," and (c) touching one of three body parts (nose, head, tummy), depending upon the experimenter's request (e.g., "touch nose").

Occurrences of ancillary behaviors (stereotypy and off-task behaviors) were also recorded for each child. These behaviors were observed to determine any potential undesirable side effects (i.e., an increase in the inappropriate behaviors) when a reduction of primary reinforcers was implemented during the experimental conditions. The ancillary behaviors are defined for each child in Table 2.

Experimental Design

A multiple baseline design across children was used. During baseline, each child was presented with an acquisition task in the manner presented at the after-school program and at school (described below). Following baseline for each task, the child was presented with a no-reinforcers condition, a praise-only condition, and a return-to-baseline condition. These conditions consisted of a change in the reinforcement contingencies for the maintenance tasks only. The order of presentation of these conditions was counterbalanced across tasks and children to expose any potential order effects. The second task for each child had an extended baseline as an additional control.

Preexperimental Assessment of Typical Motivation Procedures

Prior to data collection, the children's regularly scheduled tutorial sessions were observed for 2 weeks to determine the number of trials during which an acquisition task was generally presented, the number of maintenance tasks presented, and the schedules of reinforcement provided contingent upon correct performance for these two types of tasks. An acquisition task was defined as a task that was reportedly never presented to the child before. During a 15-min work session, 15 trials of the acquisition task were typically presented (range, 13 to 17). Correct task responses were reinforced with

food and praise on a CRF schedule. Three maintenance tasks (e.g., eye contact, hands on lap, and another previously learned behavior such as "touch head") were usually presented four times each. Contingent upon correct performance on maintenance tasks, children were presented with praise (CRF) and food (VR 3). Observed individual work sessions at school with the teacher and teacher's aide also suggested a similar scenario. The task interspersal procedures used in the after-school program and seen during the school classroom observations were similar to the task interspersal procedures used to maintain baseline responsiveness in previous studies (e.g., McGee et al., 1986; Schreibman & Carr, 1978). Experimental sessions were designed to closely approximate this by incorporating 15 trials of the acquisition task and four trials each of the three maintenance tasks. A precoded data sheet was constructed with these 27 trials (tasks) listed. The order of these 27 trials was determined randomly, with the restriction that no more than two acquisition tasks could be presented consecutively. This order of presentation was used throughout all sessions to ensure an equal number of trials of each type of task across sessions.

Experimental Procedure

The child was seated directly across from the therapist. Trials were presented when the child was sitting attentively and was not engaged in any off-task behaviors. At the beginning of each work session, regardless of condition, the therapist manually guided the child to make the correct response on the first two trials of the acquisition task. Throughout any work session, after five consecutive incorrect responses, prompting was repeated for two consecutive trials of the acquisition task. Prompted trials were not included in the data presentation. A correct target acquisition response was reinforced, even when guided, with verbal praise and a food reinforcer. An incorrect response or failure to respond within five of the therapist's requests resulted in feedback consisting of a verbal "no." These consequences were provided during all conditions of the study for unsatisfactory completion of the acquisition task. The schedule and type of reinforcer (food and praise) for the maintenance tasks varied, depending upon the experimental condition (see below). An experimental condition was presented until the learning criterion for the acquisition task was met. This criterion was 90% correct responses within 20 consecutive trials.

Baseline: Typical motivation procedure. Reinforcers were available for acquisition tasks and for maintenance tasks. Following each correct acquisition task response, the child was presented with praise and a food reinforcer. Following correct performance of maintenance tasks (e.g., "touch head," "hands down"), praise (CRF) and food reinforcers (VR 3) were provided. On both acquisition and maintenance tasks, incorrect performance was followed with a verbal "no."

No-reinforcers condition. This condition was designed to determine whether removal of food and praise reinforcers for maintenance tasks would improve acquisition task performance. In this condition, sessions were conducted as described immediately above. However, when maintenance tasks were completed, no reinforcers (food or praise) were provided. Food and praise (CRF) continued to be presented for correct responding to acquisition tasks.

Praise-only condition. This condition was presented to determine whether the removal of primary reinforcers only for maintenance tasks was sufficient to increase correct acquisition task responses. In this condition, the child was presented only with praise for correct performance on a maintenance task. As before, reinforcers (praise and food) were provided contingent upon correct responding on an acquisition task. Praise for satisfactory completion of a maintenance task was continued to make it less likely for extinction to occur than in the no-reinforcers condition.

Return to baseline: Typical motivation procedure. Following task acquisition (90% correct responses within 20 consecutive trials), sessions using typical procedures were again presented. This condition was presented to determine whether schedules of reinforcement would affect performance once criterion was met on the acquisition

task. Gloria and Jim were presented with two sessions of this return to baseline condition; Marina, Paul, and Joshua were presented with five sessions in order to assess any deterioration in performance over time.

Interobserver Reliability

During each session, two observers, who were naive to the purpose of the study, sat in the observation room and recorded the occurrence of the ancillary behaviors using a 10-s partial-interval recording procedure. The observers were initially trained to collect data with children who did not participate in this study. Through discussion of operational definitions, observations, and feedback, the observers and the therapist reached a 95% level of interobserver agreement prior to the start of the experiment. The observers viewed the sessions in another room through a one-way window.

Also during each session, the therapist and an observer (from the observation room) recorded the child's acquisition and maintenance task responses. To calculate reliability, the number of agreements between the therapist and the observer was divided by the total number of agreements plus disagreements, and multiplied by 100. Levels of agreement for percentage correct on task performance ranged from 89% to 100% (M = 96%). For the observers who recorded stereotypy and off-task behavior, reliability was calculated for occurrence and nonoccurrence on a point-by-point basis by dividing the total number of agreements for occurrences and nonoccurrences by the total number of agreements plus the total number of disagreements, and then multiplying by 100. Levels of agreement for occurrence and nonoccurrence of the inappropriate behaviors ranged from 88% to 100% (M = 94%).

RESULTS

The children's performances on the acquisition and maintenance tasks are shown in Figures 1, 2, 3, and 4. Percentage occurrence of the ancillary inappropriate behaviors for each of the children is also shown in the figures. Because there were no apparent substantive differences in changes in these two behaviors across experimental conditions, levels of responding for these two behaviors were combined. As can be seen, all the children failed to learn the acquisition task during baseline. However, when reinforcement contingencies for maintenance tasks were changed, all children reached criterion on the acquisition task. Importantly, percentage correct performance on the maintenance tasks did not deteriorate. Responding to both acquisition and maintenance tasks continued to occur during return to baseline (typical motivation procedures), suggesting a maintenance of responding once the target behavior was acquired. In general, the occurrence of inappropriate behaviors did not increase when reinforcers were removed during experimental conditions, suggesting that there were no negative side effects as a result of a change in contingencies.

During baseline, Gloria made no correct responses on Task 1 (put next to). However, by the second session of the no-reinforcers condition, an increase in correct responding had occurred. Criterion (90% correct responses within 20 consecutive trials) was soon met and 100% correct responding was maintained throughout the return-to-baseline and praise-only conditions. Maintenance tasks averaged 95% correct during baseline. Correct responding of maintenance tasks decreased slightly during the no-reinforcers condition (M = 86%), but increased to and remained at 100% throughout the remainder of the study. Performance on Task 2 (raise arms) was similar to that on Task 1. After baseline, an increase in performance occurred by the fourth session of the praise-only condition. Criterion was reached during the next two sessions; 100% correct task performance was maintained in subsequent conditions. Maintenance tasks averaged 92% correct in baseline. Performance increased to an average of 99% correct in the no-reinforcers condition and 100% correct during the return to baseline. For Gloria, occurrence of inappropriate behaviors was fairly stable throughout baseline and no-reinforcers conditions, but decreased in the last four sessions of Task 1. During Task 2, percentage occurrence of inappropriate behaviors decreased to slightly lower averages, compared with baseline.

Marina's performance was similar to that of Glo-

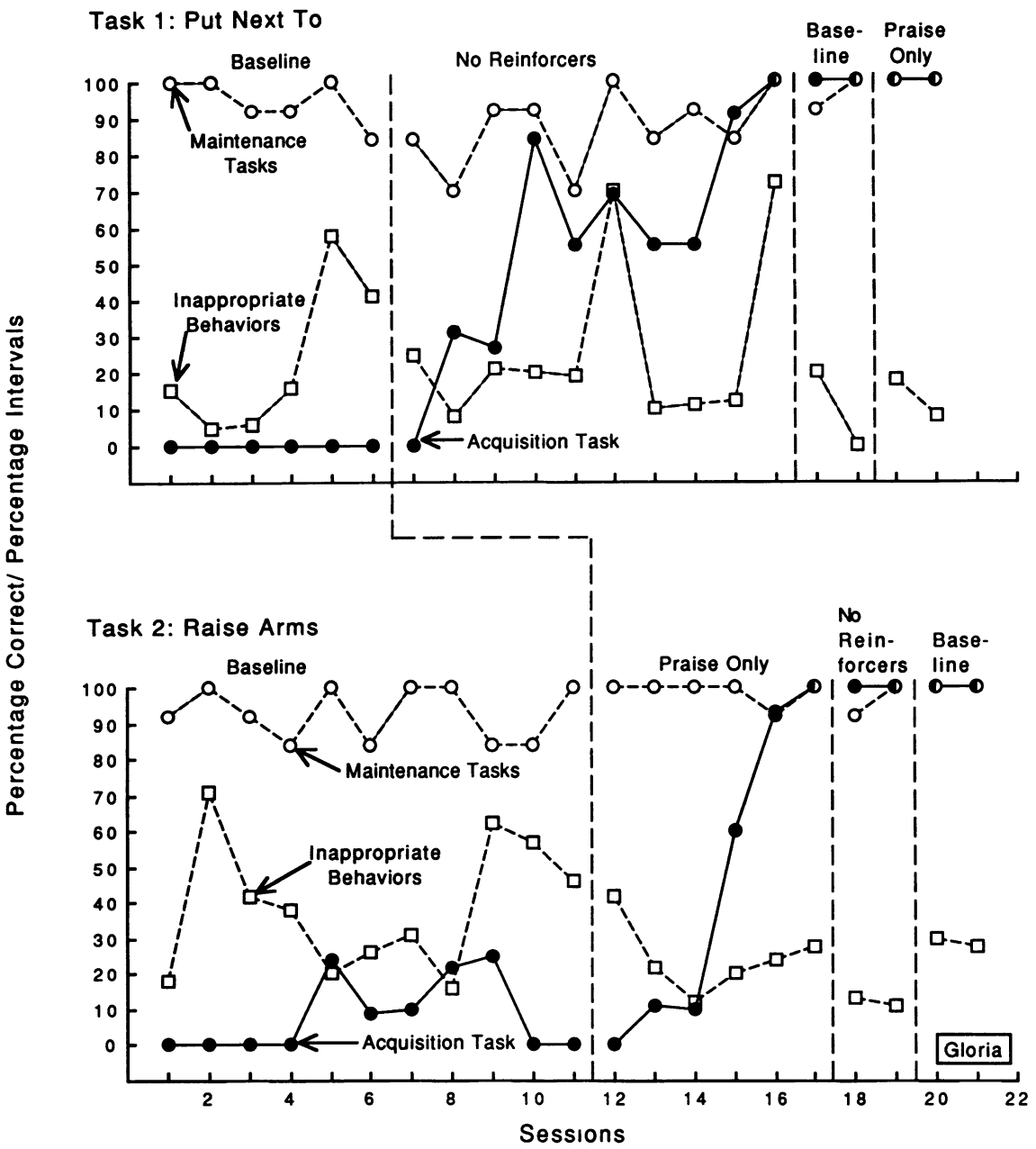

Figure 1. Acquisition and maintenance task performance (percentage correct) and occurrence of inappropriate behaviors (percentage intervals) for Gloria. Upper panel is Task 1 (put next to); lower panel is Task 2 (raise arms).

ria. After assessing baseline performance with Task 1, Marina met criterion in the praise-only condition. Performance was maintained at criterion throughout the return-to-baseline and no-reinforcers conditions. Maintenance tasks remained at a high average percentage correct throughout the conditions, although this percentage was lower than at the beginning of baseline. Task 2 was acquired during the no-reinforcers condition. Task 2 performance was subsequently maintained at 100% correct. Responding remained high in the praise-only (M = 96% correct) and return-to-baseline (M = 98%

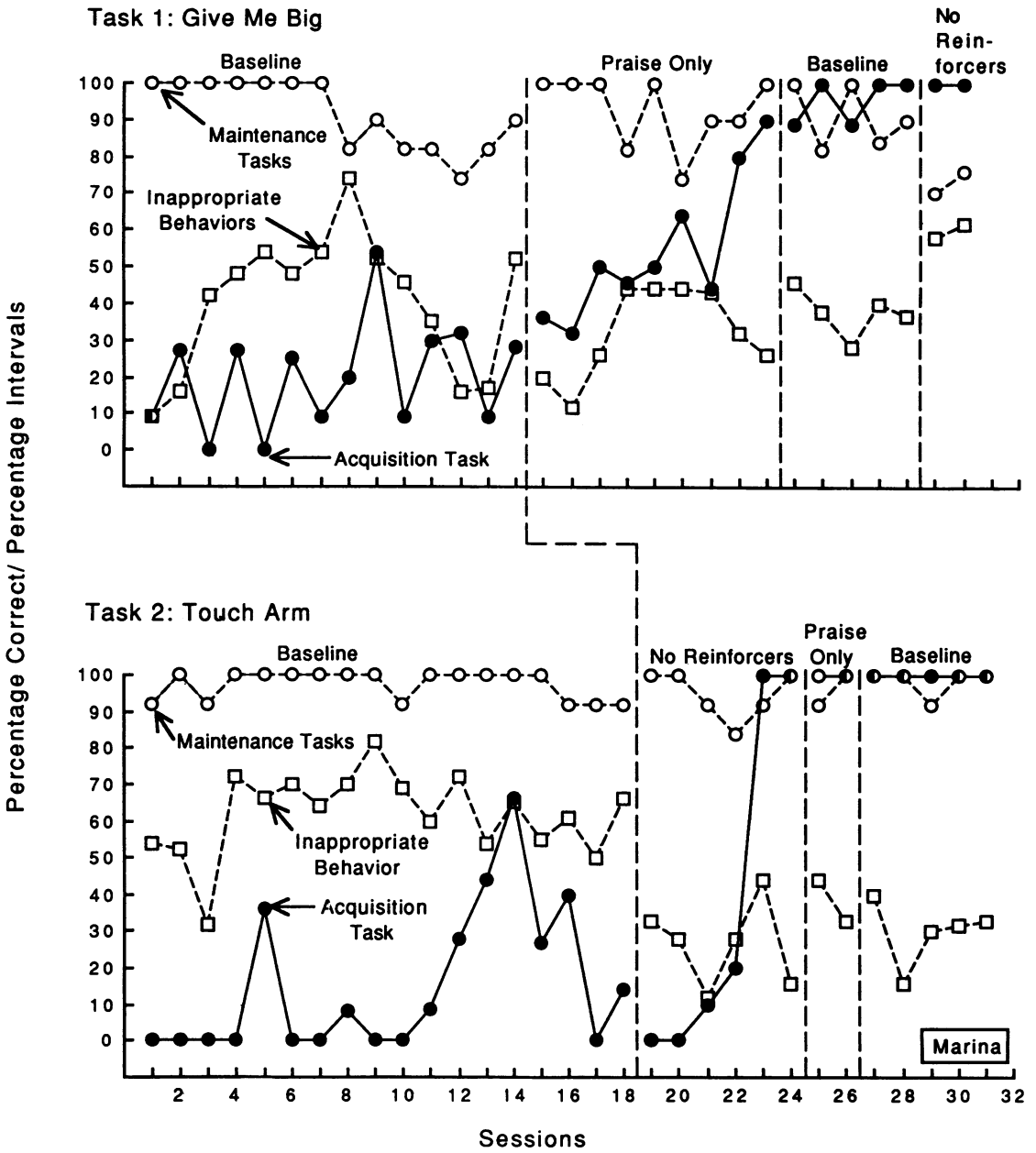

Figure 2. Acquisition and maintenance task performance (percentage correct) and occurrence of inappropriate behaviors (percentage intervals) for Marina. Upper panel is Task 1 (give me big); lower panel is Task 2 (touch arm).

correct) conditions. As seen with Gloria, the occurrence of Marina's inappropriate behaviors was generally stable across experimental conditions for Task 1. During Task 2, however, percentage occurrence decreased after baseline and remained relatively low throughout the remainder of the study.

After baseline, Paul acquired the Task 1 response during the praise-only condition. During return to baseline, task performance decreased slightly and then increased to 100% correct. Performance was maintained during the no-reinforcers condition. Maintenance task responses averaged 97%, 96%, and 97% correct during baseline, praise-only, and return-to-baseline conditions, respectively. In the

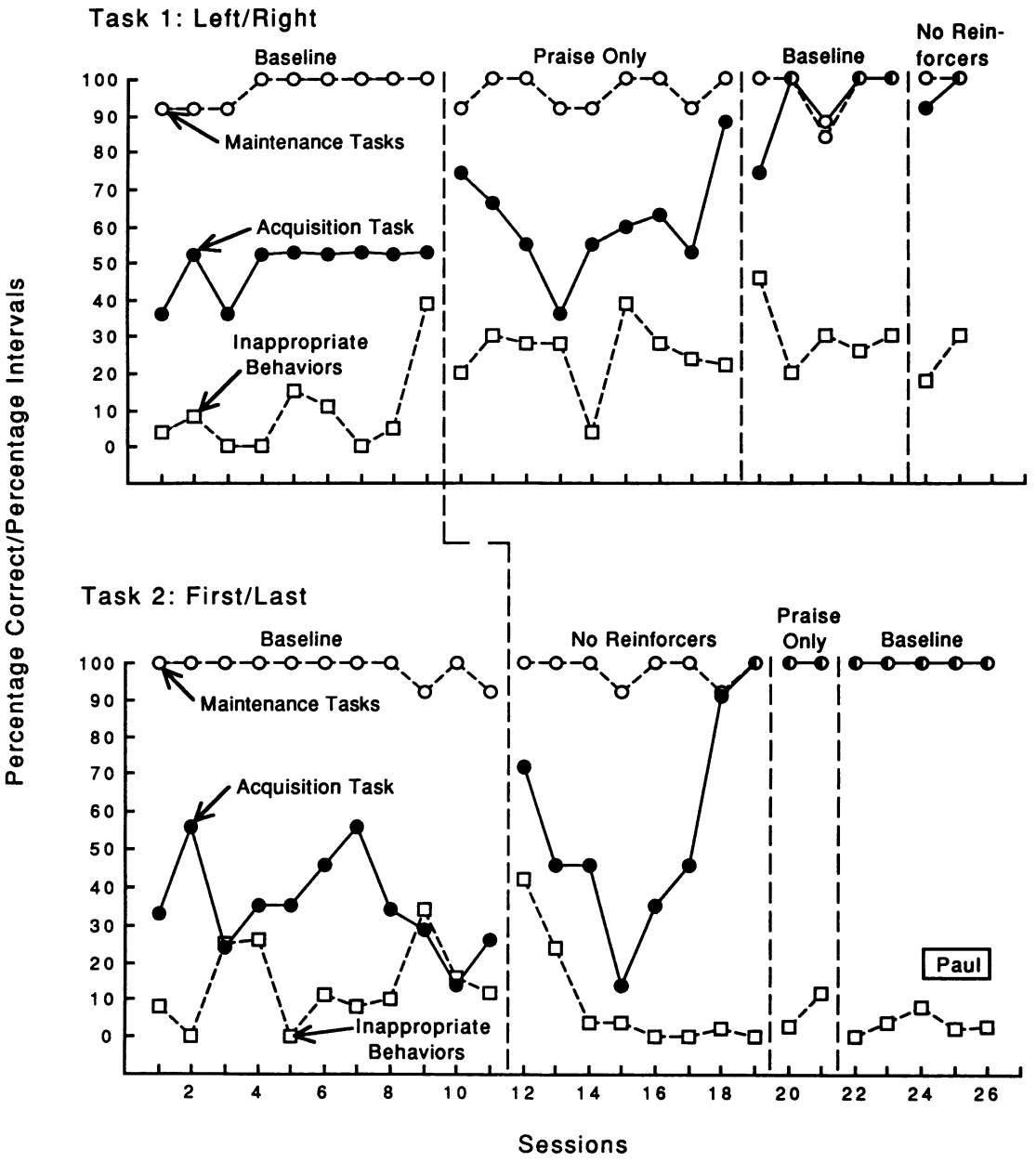

Figure 3. Acquisition and maintenance task performance (percentage correct) and occurrence of inappropriate behaviors (percentage intervals) for Paul. Upper panel is Task 1 (left/right); lower panel is Task 2 (first/last).

no-reinforcers condition, responding increased to 100% correct. Task 2 was acquired within six sessions of the no-reinforcers condition. Task 2 performance was then maintained at 100%. Performance for maintenance tasks was high and fairly consistent throughout all conditions. Occurrence of inappropriate behaviors during Task 1 increased slightly during the experimental conditions, compared with baseline. However, during Task 2, these occurrences decreased.

Joshua failed to acquire the Task 1 response during baseline. However, in the no-reinforcers condition, criterion was reached. In subsequent conditions, criterion performance was maintained. Cor-

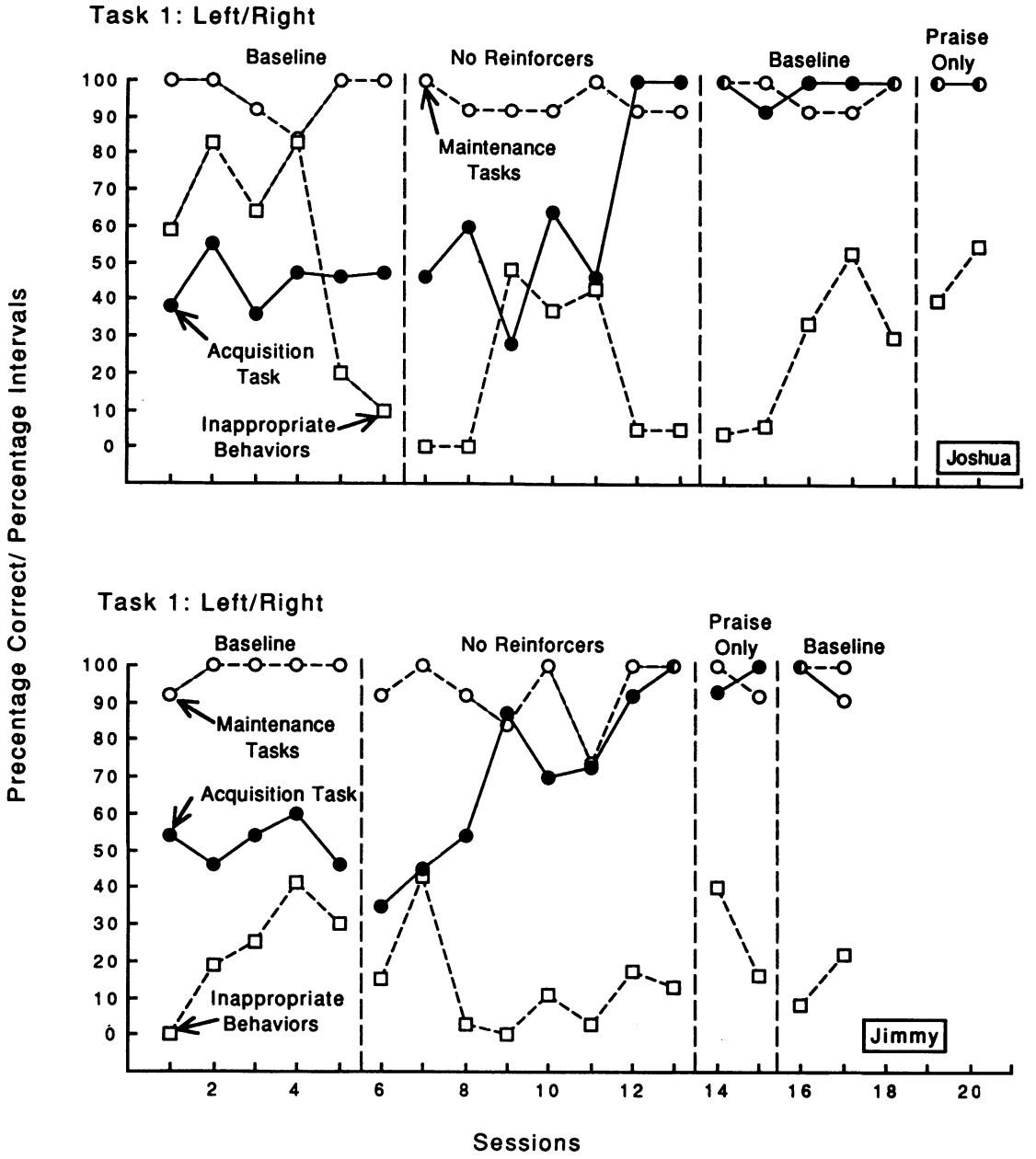

Figure 4. Acquisition and maintenance task performance (percentage correct) and occurrence of inappropriate behaviors (percentage intervals) for Joshua (top panel) and Jim (bottom panel). The acquisition task for both children was left/right.

rect maintenance task responding was also high: Joshua averaged 96% correct in baseline, 94% correct in the no-reinforcers condition, and 96% in the return-to-baseline condition. Performance increased to 100% correct in the praise-only condition. Percentage occurrence of inappropriate behaviors was fairly high during baseline. Averages were lower during the subsequent experimental conditions.

Jim's performance was similar to those of other children. Jim failed to acquire the Task 1 target response during baseline. By the fourth session of the no-reinforcers condition, an increase in performance occurred, and criterion was soon reached. Criterion performance was then maintained. Maintenance tasks averaged 98% correct in baseline. As seen with Marina, maintenance task performance

initially decreased in the no-reinforcers condition during acquisition, then increased to 100% correct (M = 96%). Performance was maintained during subsequent conditions. Occurrence of self-stimulation and off-task behavior for Jim remained fairly stable throughout the study.

DISCUSSION

The present investigation assessed the effects of different reinforcement contingencies, in conjunction with task interspersal procedures, upon autistic children's task acquisition. During baseline, which consisted of typical motivation-enhancing procedures, all the children failed to reach criteria and demonstrated below-chance levels (chance being approximately 50% correct responding) of performance. Criterion was met, however, when all reinforcers for interspersed maintenance tasks were removed, or when praise only was provided for maintenance task responding. Once criterion was met, the children maintained performance of both maintenance and acquisition tasks, even when a return-to-baseline procedure was in effect. Ancillary data suggest that stereotypy and off-task behavior did not increase when reinforcers were decreased for the maintenance tasks. In fact, 3 of the 5 children displayed decreases in these inappropriate behaviors.

The results may be explained in terms of some basic principles of learning that suggest that behavior is increased when the magnitude (e.g., Kintsch, 1962; Tarpy, 1975) and quality (e.g., Goodrich, 1960; Kraeling, 1961) of the reinforcer are improved. In the present study, the conditions (no reinforcers, praise only) that provided the richer schedule of reinforcement, in terms of magnitude and quality, were associated with superior performance on the tasks. In the no-reinforcers condition, food and praise were provided on a CRF schedule for correct acquisition tasks, while no reinforcers were available for maintenance tasks. Thus, the comparison between acquisition and maintenance tasks was one of rich reinforcement, in terms of both rate and quality, versus no reinforcement. During the praise-only condition, when correct maintenance tasks were followed by praise without food, the children's performance was similar to the no-reinforcers condition, and criteria were met. Here also, it is hypothesized that the richer schedule of reinforcement favored the acquisition tasks. That is, food is likely to be favored over praise by autistic children, who tend not to be as responsive to social reinforcers (Lovaas, Koegel, Simmons, & Long, 1973).

It is interesting that during the no-reinforcers conditions, the maintenance tasks did not extinguish. This suggests that, among other possible explanations, (a) maintenance responses had become conditioned reinforcers (e.g., Catania, 1984), (b) many more trials were necessary to see extinction effects, (c) the intermittent schedules of food previously used for maintenance tasks may have made them more resistant to extinction (Ferster & Skinner, 1957; Stokes & Baer, 1977), or (d) other reinforcers, not obvious to the experimenters, maintained maintenance task performance. Also, the absence of extinguished responding on the maintenance tasks may be related to the smaller amount of previous reinforcement available via a partial schedule of reinforcement and a large amount of previous training, both of which may contribute to making a behavior more resistant to extinction (e.g., Tarpy, 1975).

Both experimental conditions provided richer schedules of reinforcement, in terms of both magnitude and quality, that favored the acquisition tasks. These schedules perhaps facilitated the effects of task interspersal procedures that, during baseline, were not sufficient to produce learning. During baseline, the CRF schedule of food and praise for the acquisition tasks may not have actually differed much from the VR 3 schedule of food and praise for the maintenance tasks. Although food was provided on a thinner schedule of reinforcement for maintenance task responses, these behaviors were already in the child's repertoire and thus were more likely to be emitted than the acquisition task. Consequently, the child was more likely to obtain food reinforcers for maintenance tasks than for acquisition tasks. Indeed, the data show few correct acquisition task responses during baseline. Thus, during baseline, this procedure may have inadvertently favored, in terms of response requirements, the

maintenance tasks because the acquisition task was not yet learned.

This may explain why no reversals in performance on the acquisition tasks occurred during the return-to-baseline conditions. Once criterion was met during experimental conditions, correct responding on acquisition tasks occurred frequently. The richer schedule was now for the acquisition task (CRF), as opposed to the maintenance tasks (VR 3).

Importantly, the differences in the various schedules of reinforcement distinctly associated with the experimental conditions suggest that a behavioral contrast may have been in effect as a result of the use of multiple schedules of reinforcement (e.g., Catania, 1984; Ferster & Skinner, 1957). Ferster and Skinner (1957) defined multiple schedules as "consisting of two or more alternating schedules of reinforcement with a different stimulus present during each one" (Ferster & Skinner, 1957, p. 503). Indeed, in the present experiment, although not precisely analogous to a multiple schedule paradigm (i.e., one of the two alternating schedules is usually extinction), different schedules of reinforcement were associated with the acquisition tasks and the maintenance tasks, and these schedules continued to differ under the various experimental conditions. A behavioral contrast may have occurred when the reinforcers (both in terms of schedule of presentation and quality) were changed during the no-reinforcers and praise-only conditions. This behavioral contrast may have set the occasion for improved performance on the acquisition task during both experimental conditions. The CRF for acquisition tasks during the no-reinforcers condition was not necessarily independent of the complete removal of all reinforcers for the maintenance tasks. Such a contrast would increase the likelihood of acquisition, especially because the maintenance tasks were essentially under extinction (Catania, 1984). During the praise-only conditions, a behavioral contrast may have also been in effect in that the loss of food reinforcers for the maintenance tasks had an enhancing effect upon the CRF for acquisition tasks. Although multiple schedules were in effect during baseline, a behavioral contrast may not have occurred because the actual obtainment of reinforcers, due to the prior performance of maintenance tasks, may not have cued the children that a more dense schedule of reinforcement for acquisition tasks was in effect. As hypothesized earlier, this discrimination between schedules of reinforcement during the return to baseline was unlikely, given the ease of obtaining reinforcers for the maintenance tasks and the actual sparseness of reinforcer delivery for the acquisition tasks, because of the children's lack of prior learning of the acquisition tasks.

The interpretation of our results in terms of multiple schedules and behavioral contrast, although not identical with the basic experimental literature (see Catania, 1984, for a full description), seems to be a parsimonious explanation of our results. Indeed, Ferster and Skinner (1957) suggested that "one component of a multiple schedule may be used as one index of motivational conditions whose effect upon the other component schedules is being studied" (Ferster & Skinner, 1957, p. 503). This explanation, taken with the enhanced reinforcement schedules (in regard to quality and magnitude of reinforcement), suggests why different schedules of reinforcement may be important when designing treatment programs for autistic children. These hypotheses, in combination with our data, suggest that reinforcement schedules may have an important impact upon the efficacy of task interspersal procedures and support the concomitant use (or incorporation) of both tactics to teach autistic children.

Our baseline results and the previous literature on task interspersal (e.g., Dunlap, 1984; Dunlap & Koegel, 1980) may initially appear to be contradictory. However, the two cannot be compared directly. Food reinforcers were not always used in the previous studies on task interspersal. The type of reinforcer dispensed may interact with the effect of quality of reinforcement upon performance. Also, in the previous literature, reinforcers were provided on a CRF schedule for both acquisition and maintenance tasks. This is likely to affect the magnitude of reinforcement. Those previous studies that presented contingencies in a manner similar to that of the present study (e.g., Charlop et al., 1983; McGee et al., 1986; Schreibman & Carr, 1978) demon-

strated similar findings. It seems that combining conditions that set the occasion for behavioral contrast through the use of multiple schedules in a teaching session may optimize learning, while concomitantly improving the parsimony of the approach by eliminating the need for tangible reinforcers for maintenance tasks. Thus, we advocate the continued study of reinforcement schedules in conjunction with task interspersal procedures.

In addition, other differences between our study and previous research on task interspersal procedures emerge. The participants in our study may be representative of children for whom task interspersal procedures alone are not sufficient. For these children, the present study provides some additional considerations for treatment planning. Also, it is important to note that in previous task interspersal research, the experimental conditions in which task interspersal procedures were provided generally consisted of fewer treatment sessions. For example, the largest number of sessions was approximately 24 in Dunlap (1984) and 70 in Neef et al. (1980). Our long baselines, in conjunction with the children's previous histories with task interspersal procedures, suggest that the effects of task interspersal procedures over time may change (Favell, 1991). This possible change in efficacy over time provides support for continued analysis of (a) individual differences in responsiveness to these procedures, (b) the long-term use of these procedures, and (c) the facilitators of efficacy (e.g., schedules of reinforcement) for these procedures.

Our ancillary data showed few, if any, changes in stereotypy and off-task behavior throughout the study. The children did not react adversely when reinforcers were removed for maintenance tasks. Indeed, some children slightly decreased their inappropriate behaviors. This provides evidence not only of the absence of negative side effects for behaviors that typically interfere with learning as a function of a change in contingencies but also that task interspersal with food reinforcers for acquisition tasks only may be a means of decreasing inappropriate behaviors (Horner, Sprague, O'Brien, & Heathfield, 1988).

The limitations of this study must be carefully considered. The therapists were not completely naive to the nature of the study. However, it seems evident that the results were unexpected in that both the no-reinforcers and praise-only conditions were effective and that no reversal was seen. Second, every possible combination of conditions was not presented, in that the children never received praise only for correct acquisition task responses. This condition was not included because it was believed that praise for acquisition task responses would provide a less rich schedule. Although unlikely, it is possible that other higher functioning autistic children or other populations that tend to be more responsive to social reinforcers may demonstrate that praise is as salient a reinforcer as food. Finally, to our knowledge, this is the first study that combined different schedules of reinforcement with task interspersal procedures. Replication of our results is needed.

The present study provides support for the consideration of reinforcement contingencies when designing procedures to motivate autistic children through task interspersal. Our data suggest the efficacy of two procedures, the no-reinforcers condition and the praise-only condition. Although both were effective, we maintain a preference for the praise-only condition because (a) the long-term effect of no reinforcers for maintenance task response has not been assessed, and (b) many autistic children maintain very limited behavioral repertoires. We predict that it would be very difficult for those who interact with autistic children not to encourage and react to the occurrence of correct responses.

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